

DOCUMENT RESUME

ED 234 898

PS 013 824

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TITLE A Study of the Effect of Computers on the Preschool Environment.
PUB DATE Jul 83
NOTE 49p.; Master's Thesis, Oakland University.
PUB TYPE Dissertations/Theses - Master Theses (042) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Computer Literacy; *Educational Environment; *Educational Innovation; Educational Research; *Learning Centers (Classroom); *Microcomputers; *Preschool Children; Preschool Education
IDENTIFIERS *Computer Uses in Education

ABSTRACT

A computer activity center was established in a preschool in order to investigate the effect of the introduction and use of microcomputers on the environment and to assess the appropriateness of computers as tools for the preschool. The center consisted of one 16K Atari 400 computer, a black and white television, a cassette memory storage device, and a joystick. Three programs were selected for use: Drawpic by Artworx, Video Easel by Atari, and Blox by Geof Nieboer. Data were gathered by continuous observation and audiotaping of children's verbal interaction. An observer checklist was used to record length of computer use per child, type of interaction, whether the children saved their work, general comments, and the number of observers at the center. A questionnaire was used to determine characteristics of the sample. Results indicated that, although the computer did not dominate the children's day or interrupt the flow of classroom activity, every child chose to work in the center once during the study. Creating no unique management problems, the computer center provided opportunities for fine motor development, creative involvement, verbal expression, problem solving, widened experience, success, and pride in achievement. (Appended are computer program descriptions, observation sheets, parent letters, a parent questionnaire, and selections from transcribed recordings of children's interaction.) (RH)

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A STUDY OF THE EFFECT OF COMPUTERS ON THE PRESCHOOL ENVIRONMENT

Presented to
the Faculty of the School of Human and Educational Services
Oakland University

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts in Teaching in
Early Childhood Education

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by

Ruth Ann Nieboer
July, 1983

Anne Porter Jaworski, Ph.D., Advisor

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CHAPTER I

INTRODUCTION

This study is being conducted to observe and record the effect of child-controlled computers on the preschool environment and to determine their appropriateness.

Some educators, parents and, certainly, a great many vendors are urging the introduction of computers to preschool children. The computer has greatly affected the day-to-day activities of each one of us. Anxiously adults scurry to become computer literate fearful that they will be left behind in a new world. They are determined that children in their care will be better prepared -- totally prepared -- for tomorrow's world. This total preparation included, in their vision, computer literacy. While computer literacy un-
added to the school curriculum some determination must be
doubtedly must be made regarding when to introduce it. Viewing the computer as a basic learning tool some educators believe it should be introduced as other tools are in the preschool years.

A decision to include computers in the preschool setting cannot be made responsibly without determining whether computers can make a contribution toward the major goals of early childhood educators: (1) to broaden the experience base of the child, (2) to facilitate social/emotional cognitive, physical and language development. This project is designed to provide information on

which to base the immediate educational decisions which confront early childhood educators.

The pilot project included groups of fifteen to twenty children. The children were primarily normal middle-class four-year-olds from families connected with the U.S. Air Force Base near Detroit, Michigan. The project was limited to two half day sessions each week for eight weeks.

Child-controlled computers should be understood as computers equipped with child-friendly software, that which can be used freely by the child with a minimum of supervision or assistance. The computers we intended to serve as creative tools or provide a framework for exploration and problem solving.

The paper which accompanies and results from this study includes the following:

1. A review of literature and research obtained through a search of ERIC materials on computer uses with children under 9, a review of popular computer journals not listed in ERIC, as well as, an overview of the general development of 3-5 year olds.
2. A description of the study as conducted in the center. The study used computer centers in a free access setting. Data was collected through continual audio taping and observer checklists. Behaviors observed include but were not limited to: length, number and result of child-computer interactions; frequency and type of child/child interactions; frequency and type of child/teacher interactions; body language as an indicator of attitudes.

3. Complete results of the study and an overview suitable for general distribution.
4. Recommendations for further research.

CHAPTER II

REVIEW OF THE LITERATURE

Educational Theorists on Computers

Computers are relatively recent additions to the educational milieu. Consequently a great deal has been written recently by educational philosophers and theorist about the inclusion of computers in modern curricula.

These theorists tend to view the study of the world of computers and children in one of three distinct ways. "First, is the view that a computer is in fact a tool for thinking, which implies that it might be applied fruitfully at every educational level... Second, is the desire of some educators to study the thinking processes of people solving problems... Third, is a synthesis of human problem solving and computer-as-tool, flamboyantly named 'artificial intelligence research', which aims to formalize problem solving procedures." (Cannara, 1976)

As a tool the computer is unequalled. It is primarily a machine for sorting and manipulating -- processing -- information. It can do this very quickly and accurately which gives it a big advantage over people for some applications." (Rushby, 1979) In allowing children to manipulate information we allow them to create models of their ideas. The computer can be thought of as

a blank slate upon which the child, with only minimal assistance may create its own world. "The computer is the Proteus of machines. Its essence is its universality, its power to stimulate. Because it can take on a thousand forms and can create a thousand functions, it can appeal to a thousand tastes." (Papert, 1980)

Analogies abound among these philosophers who liken the introduction of computers to that of pencils or books. (Papert, 1980) A. B. Cannara states, "As a medium for expressing, manipulating and communicating ideas, the personally accessible computer may stand well above everything since the printing press." (Cannara, 1976) Regardless of its comparative value in the realm of educational and exploratory tools, perhaps its best recommendation is "the provision of a domain in which kids don't have to take someone's word as to what happens." (Moshell, 1982)

Many educators theorize that through learning to solve problems using computers, programming, people can develop better problem-solving strategies of their own. (Harris, 1982; La France, 1979; Nelson, 1981; Perlman, 1976; Solomon, 1975; Solomon, 1976; Watt, 1979) Only by closely examining their own mental processes can a student program a computer effectively. Sometimes this means "playing turtle" -- studying their own physical behavior while drawing a shape in order to draw that shape with a computer controlled mechanical turtle. Sometimes it means carefully considering the steps in a relatively simple act involving both

physical and mental processes such as sorting.

Robert Seidman studied the effects of learning structured programming on logical reasoning ability in a controlled experiment published in 1981. Mr. Seidman's results indicated that programming skill was not related to ability to perform on tests of reasoning ability. (Seidman, 1981) John Molluzo feels that good programming follows good logic rather than the reverse. Consequently even if programming itself does not lead to good reasoning, programming may allow many opportunities to practice logical reasoning. (Molluzo, 1982)

Computer Applications in Education

Published articles on the practical uses of computers in education group themselves in three categories.

The first category can be described as computer-assisted-instruction. CAI is an area of computer use which is expanding rapidly. Too often computer-assisted-instruction is accomplished using educationally unsound programs carelessly produced by vendors eager to enter the new software market and purchased by staff members who have not considered their impact. Because of this mediocrity many educators set CAI aside too quickly. Some exceptional research in this field indicates that CAI which is skillfully programmed may be an ideal medium for presenting some material.

CAI programs can be developed to model the learning styles of students. This means that the computer can "learn" by the student responses about student learning style and can then adapt further instruction so that it is presented in the best possible manner for that child. (Carr, 1977; O'Shea, 1979)

Joan Sieber has shown that sensitive students who have high anxiety in the regular classroom may find the privacy and non-judgemental interaction of CAI relaxing, creating a better learning environment for those children.

The second category includes articles concerned with computer literacy programs. These take many forms ranging from very simple courses designed for children in upper elementary grades as introductions to vocabulary, programming and some technical matters concerning computers to highly technical classes directed toward math students or specific use courses such as word processing. Very few articles address the needs of the young child in relation to computers.

One notable exception is the work of Beverly Hunter. Her project defines computer literacy as "whatever a person needs to know and do with computers in order to function competently in our information based society." (Hunter, 1980) This project, sponsored by the National Science Foundation, is working toward a curriculum guide for the infusion of computer literacy into the total curriculum. "To me," says Ms. Hunter, "the most compelling argument for the infusion approach as opposed to trying to add computer literacy courses, has to do with the real

substance of computer literacy. The whole point of computers in our information-based society is to provide us with the tools we need to solve problems, to augment our intellects, and to give us relevant information when we need it. For a young student, this means tools to use in learning and doing math, science, social studies, and whatever else he/she is learning. This infusion approach attempts to provide these tools in a manner and context that is clearly relevant to the students' work." (Hunter, 1980) Ms. Hunter's K-8 program has humanistic goals and concerns itself with relevant aspects of child development.

The last category contains articles which focus on the development and use of computer environments -- environments created by computers which have been programmed with carefully designed languages. Within these environments students can "examine, analyze, predict, execute, scrutinize, experiment, modify, generalize, invent and discuss." (Peele, 1974) A most important factor of the computer environment is that it allows control through programming. While no research is available to correlate such computer experiences with self-concept, those who have worked with children and computers in this fashion agree that many students blossom when allowed freedom with the machine. Because the student controls the environment there is no way to fail. In such an environment enhancement of self-concept is thought to be inevitable. Moshell speaks of meta messages which

tell the child "You can do this stuff as well and beautifully as everyone else." (Moshell, 1982) MIT researcher Radia Perlman stresses "the most important thing the child learns in a computer environment is a fearless, joyful attitude towards learning." (Perlman, 1976)

The most practical research, and that which was the most useful in this study, was the exhaustive artificial intelligence project done for the National Science Foundation by MIT. This project developed the LOGO learning environment and tested it with a wide range of students. This was accomplished in many settings ranging from the Brookline project which involved all sixth grade students in a Brookline school (Watt, 1979) to a case study of one eight year old in a tutorial situation (Lawler, 1980).

Cynthia Solomon's work with young children and the mechanical turtle controlled via LOGO yielded many useful suggestions about attitude and approach to this experience. She advocated "playing turtle" and keeping a "bug collection." "The bug collection is collected, not found in a book... we can laugh together at funny bugs, at how some keep coming up, how we find some hard to fix. And in the computer world... bugs and debugging are part of life... we live with them and learn to like living with them." (Solomon, 1976) She emphasizes the carefree and joyful attitude one must bring to LOGO.

Also while working with the LOGO project Radia Perlman designed TORTIS, a system of special terminals and software which is designed to provide programming capability for very young children. Perlman realized the importance of keying operational systems to the abilities of the child. Beginning with a very simple nine-key terminal or Button Box the child finds the machine well within its capabilities. This mastered, the system can be expanded by the addition of the eleven-key Number Box and finally a Slot Machine. (Perlman, 1976) Perlman suggested that such attention to child development is vital in the development of effective computer programs for children.

Child Development

Knowledge of child development, physical and emotional, as well as cognitive, is essential when designing programs for young children because "if we teach at a level below the child's stage of development, he is bored because it is too easy for him. If our teaching is over his head, the child is frustrated and confused. But if it is geared to the child's operational level, then it can present him with just enough 'cognitive conflict' to stimulate and interest him." (Pulaski, 1971)

The preschool years of four and five are ones in which the young child is making great physical strides. Their gross motor control is increasing as they gain skill in climbing, balancing, jumping, swinging and other whole body activities. (Jaworski, 1982) During these years "hand preference becomes more firmly

established, as the left and right hemispheres of the brain become more specialized." (Smart, 1978) This is a major contribution toward mastery of fine motor tasks.

As the child masters many motor functions he gains in self esteem as well. A base of positive, successful experiences is necessary in the preschool years to nurture a healthy self concept. The amount of interest and motivation that the child shows is closely connected with his self-image. "...the way he behaves, the confidence with which he tackles new problems, the interest he shows in learning new things -- all are a function of his self-image." (Pulaski, 1971)

Piaget tells us much about cognitive development in the preschool child. He terms this child pre-operational. At this time "cognitive behavior is still influenced by perceptual activities. Actions are internalized via representational functions, but thought is not liberated from perception." (Wadsworth, 1979)

The four and five year olds are developing concepts of time, space, quantity, animism and causality. (Smart, 1978)

Some obstacles to logical thought are still present at this time. They are: egocentrism, inability to take the role of another; inability to perceive transformations from one state to another but rather only the elements in the sequence; lack of reversibility, inability to reverse the steps in a line of reasoning; centration or the inability to perceive all aspects of

a stimulus. (Wadsworth, 1979)

The medium most vital to carry a child through this period of cognitive development is play. (Pulaski, 1971) "Play cuts across cognitive, imaginative, and motor activities, using them all and weaving them together. After a period of free play with a collections of objects children were more able to respond to questions about the uses of the objects. Through playful activity, it is thought, the children organized experiences and cognitive abilities in such a way that they could generate a variety of ideas. Play facilitated cognitive, imaginative, and adaptive behavior." (Smart, 1978)

Computer and the Young Child

Because it is a basic tool which can function in any way that the programmer chooses the computer is remarkably well suited to the education of young children when used as part of a balanced program.

The physical operation of the system may be made to require varying degrees of fine motor control from crude to skilled, as the child's potential and motivation increases. With the rapid development which occurs in fine motor skills in the preschool years such an adaptibility is a great advantage. Beginning with a few very simple command keys or joystick operations the system can grow in complexity as the child becomes more comfortable with the equipment. The progression in operational systems from

simple to complex also will parallel the child's ability to symbolize.

Good programming, again, puts the child in control of the computer and his learning. Whether through interesting, sensitive CAI or the creation of explorable computer environments the computer can allow the child to have successful experiences which contribute to positive developments in self-concept.

Carefully designed software can bring sophisticated concepts within the grasp of the preoperational child by making the abstract concrete. The child can perceive more easily ideas of time, quantity and causality by manipulating these ideas easily using the computer.

Computers, like books and audiovisuals, can be excellent tools at this level of education. Their appropriateness is determined by the programmer whose awareness of development, understanding of educational goals, ability to maintain a relaxed playful attitude and imagination can create unparalleled opportunities for young children.

CHAPTER III

METHODS

This study focused on two primary goals. First, the project was designed to study the effect of the introduction and continued use of microcomputers on the preschool environment. Second, the project was designed to evaluate the appropriateness of computers as tools for the preschool.

The study involved the placement of a computer activity center in an established preschool environment. Introduction of the center was to be minimal, involving only those instructions absolutely necessary to the safe use of the equipment, operation of the immediately available software and the introduction of vocabulary pertinent to the center. Throughout the study a variety of activities and software were introduced as individuals demonstrated expanding interests.

The center consisted initially of: One 16K Atari 400 computer, a black and white television, a cassette memory storage device and a joystick. The equipment was placed on a child-sized desk near the quiet area of the preschool. A child's chair was provided. The equipment was chosen because of reasonable cost, availability, potential for expansion, diaphragm keyboard, the wide variety of software already available and graphics capabilities which seemed

ideal for the creation of software for the nonreader. The diaphragm keyboard is not only childproof, making it ideal for the varied environment of the preschool, but also allows use of keyboard masking. Easy to make keyboard masks were made from posterboard. Cutouts in the masks revealed only those keys necessary for the operation of the program.

A wide variety of software was reviewed for this project including designs for general applications as well as those labeled as preschool programs. Software was evaluated by the appropriateness of the material, ease of use by staff, ease of operation by children and range of activities possible within the program. The software naturally fell into three areas: (1) entertainment, (2) computer assisted instruction and (3) creative, child-controlled programs. Although many excellent programs were found a decision was made to use only programs which were creative and child controlled.

After hardware type and memory size were considered three programs were selected for use -- Drawpic by Artworx, Video Easel by Atari, and Blox by Geof Nieboer. These three programs incorporated features which made them ideal for beginning computer literacy. All programs used both joystick and keyboard as input devices. All used standard entry procedures -- input, then return. Each program demonstrated in some way a feature unique to computers. Drawpic demonstrated the computer's ability to record and manipulate input plotted by the joystick. Video Easel lacked the save feature

but did manipulate similarly plotted input through quad drawing to form kaliedoscopelike displays. Blox manipulates prestored shapes to create new images and can store these new images.

In evaluating the effect of microcomputers on the preschool environment the following questions were considered.

1. Does the computer center affect the flow of classroom activities?
2. How does the computer center compare to other activity centers in terms of attractiveness to children?
3. What management problems are created by the center?

The appropriateness of the computer in the preschool was judged by examining whether or not computer use met the general goals of preschool education. These goals include: fine and gross motor development, social development, language development, cognitive development, emotional growth and the broadening of the child's experience base. More specifically the study seeks answers to the following:

1. Does the computer center contribute to fine motor development?
2. Does the computer center contribute to gross motor development?
3. Does the computer center develop an ability to take turns?
4. Does computer use encourage social interaction?
5. Does computer use encourage language development?

6. Does computer use encourage problem solving behavior?
7. Does computer use encourage creative activity?
8. Does the computer center allow experiences useful in daily life?
9. Does the computer center allow experiences useful in academic life?
10. Does the computer center broaden the child's experience base?
11. Does the computer center provide opportunities for success?
12. Does the computer center provide sources of pride in achievement?

Affirmative answers indicated appropriateness to the preschool setting; negative answers indicated inappropriateness.

The data to answer these questions was provided by continuous observation of the center. Observations of verbal interaction were recorded by continuous audio-taping of children functioning in the center. These tapes were transcribed for later study. An observer checklist was used to record length of computer use per child, type of interaction, whether the children saved their work, general comments and a record of the number of observers at the center at five minute intervals.

Baseline data was gathered by means of a questionnaire to determine the characteristics of the sample and hence the validity of the study in various situations.

Appendices include program descriptions, observation sheets, parent letters, and parent questionnaire.

CHAPTER IV

RESULTS

Population

The population involved in this study consisted of two groups of children. Group I included sixteen children - mean age = 4 years 5 months. Group II included thirteen children - mean age = 4 years 9.4 months. All subjects were children of families from a U.S. Air Force Base near Detroit, Michigan.

The mean age of the children was 4 years 7.14 months. They were, typically, the youngest child in a family of two or three children.

These were all two parent families in which the children were primarily in the care of their mothers. The mothers were all high school educated with 37% possessing undergraduate or higher degrees. Their mean age was 31.21 years and they characterized themselves, primarily, as housewives. Fathers were all high school graduates with 62% possessing undergraduate degrees and 31% graduate degrees. Their mean age was 32.1 years. All were military employees with the majority in the officer's ranks.

Sixteen of twenty-nine questionnaires indicated that video games were available to and were used by the children at home.

Five of the twenty-nine respondents indicated that their families owned computers, four of which were available to children. All children had used video games whether at home, with friends or at an arcade, although only one child indicated computer use outside of the home.

The groups were different in the following ways: The children in Group I were younger than the children in Group II. The parents of the children in Group I were older and tended to be better educated than the parents of children in Group II.

Observation Data

The observer checklists provided the following information on child-computer interactions.

One hundred and fourteen child-computer interactions occurred during the study. The mean number of interactions per child over all sessions was 3.56; the mode was 3. Both males and females interacted equally with the computer. The number of interactions by female students averaged 3.65 while the average number of interactions by male students was 3.47. (Details are available in Table II.)

The length of child-computer interactions varied between 58 seconds and 1328 seconds. The mean interaction time was 405.01 seconds. Although there was little difference between male with an average interaction time of 429.35 seconds, and females, whose average interaction time was 389.65 seconds; there was a great

difference between the younger Group I, 325.26 seconds and the older Group II, 525.46 seconds. (Details are available in Table II.)

While an attempt was made to analyze the data to discover whether interaction time lengthened or shortened with experience the scope of the study made any conclusion impossible. (Details are available in Table III.)

The observer checklist also recorded the number of children acting as observers present at the computer at five minute intervals. While initially the number of children observing was very high, up to seven at a time, the number rapidly decreased to near 0. These later observers were generally waiting for a turn at the computer center. (Details are available in Table IV.)

General Observations on Effect

In evaluating the effect of microcomputers on the preschool environment the following questions were considered.

Does the computer center affect the flow of classroom activities? During the first session involving the computer many children were attracted to this center. For that day the flow of general activities was greatly altered much as it was when other new activities (a post office addition to the dramatic play area) were introduced. Subsequent sessions showed no interruption of general classroom activity.

How does the computer center compare to other activity centers in terms of attractiveness to children? Individuals visited the center approximately every other session. The average interaction time was 6.75 minutes, approximately 6% of the time available for free play. Although no records were kept to compare the popularity of other activities it appeared that the room remained balanced with dramatic play and blocks remaining the most popular activities.

What management problems were created by the center? During the initial session with the computer center up to seven children crowded around the center to watch activity there and to compete for turns. There was some arguing about the length of time spent there and who would use the center next. The researcher did not intervene in these situations and they were resolved by the children themselves. The other sessions went quite smoothly with no management problems. Children made arrangements among themselves for turn-taking and self-regulated the length of turns.

Observations on Appropriateness

In judging appropriateness of computer center in preschools a series of questions was proposed in the study design which would indicate whether this activity met the general goals of preschool education. Affirmative answers indicate appropriateness, negative answers inappropriateness.

Does the computer center contribute to fine motor development? Yes, both joystick and keyboard controls required skilled and coordinated fine motor movement.

Does the computer center contribute to gross motor development?

No, the children remained seated and physically passive during their use of the center.

Does the computer center develop an ability to take turns?

Yes, the children worked out their own system for turn taking as well as limiting length of interactions.

Does the computer center encourage social interaction? No,

early in the study, observers and players conversed frequently about their activities but after several sessions the children became quite restrained in their desire to discuss their work. Computer time became a very personal time which was discussed after the work, if at all.

Does the computer center encourage language development?

Uncertain. Language at the center was brief while the children concentrated on their creations. When they chose to talk with the researcher or with children observing, about the work, their language was very full and rich in imaginative and descriptive detail (see Appendix). Comparisons must be made with other areas to answer this question adequately.

Does computer use encourage problem solving behavior? Yes,

the computer posed several real problems for the children both social and technical. The scrolling cursor, for instance, caused confusion at first. As individuals and groups of two or three puzzled over the "disappearing" cursor they discovered, experimented

with and hypothesized about the scrolling phenomenon.

Does computer use encourage creative activity? Yes, frequently the initial movements of each interaction with the computer were somewhat random but, like clouds or woodgrain, stimulated imaginative development of great detail.

Does the center allow experiences useful in daily life? Yes, as the computer becomes more pervasive at banks, gas stations, etc. the computer center allows real life experience. Many children related their experience to what their parents did at work.

Does the center allow experiences useful in academic life? Yes, many schools now begin computer-assisted-instruction in first grade. Such early unstructured computer experiences such as those in the study will ease their introduction to more directed uses. This is similar to the use of free expression with crayons and early storytime to prepare for writing and reading activities.

Does the computer center broaden the child's experience base? Yes, the population data indicated that experience, especially child directed activity, with computers was unlikely to occur outside the school setting.

Does the computer center provide opportunities for success? Yes. At no time during the study did a child indicate disappointment regarding his work. Because of the nonstatic display the children had infinite opportunities to change their work to suit themselves or to change their goals.

Does the computer center provide sources of pride in achievement? Yes, children perceived the computer as "hard" prior to their work at the center. While their general perception did not change, they were successful and so displayed great pride in achievement (see Appendix).

Conclusion

The inclusion of a computer center in the preschool setting appears to be a positive and wholly justifiable act. Every child chose to work in the center once during the study though it never dominated their day or interrupted the flow or classroom activity. The center created no unique management problems. While the center did not contribute to gross motor development or generate a great deal of social activity it did contribute to every other goal of the early childhood program. The computer center allowed opportunities for fine motor development, creative involvement, verbal expression, problem solving, widened experience, success and pride in achievement.

TABLE I
Summary of Questionnaire Responses

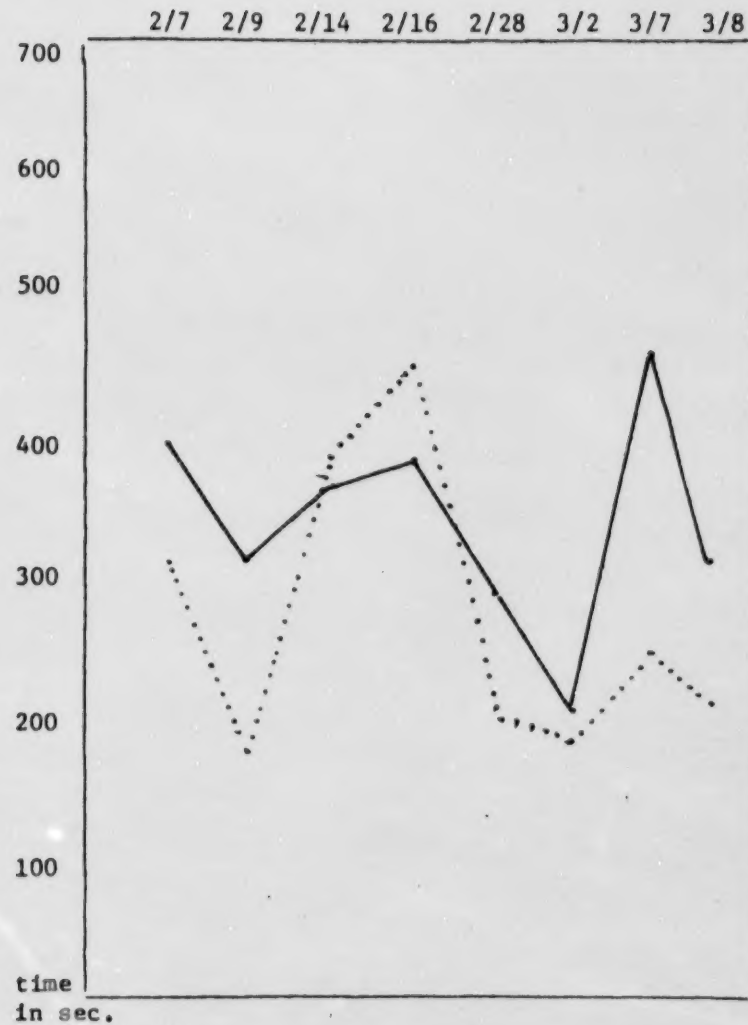
	Group I	Group II
Number of people in the family		
median	4	5
mean	4.25	4.62
Child's position in the family		
only	3	2
oldest	5	2
middle	1	2
youngest	7	7
Mother's age		
median	31	31
mean	33.25	28.69
Mother's highest education level		
high school diploma	8	10
undergraduate degree	7	3
graduate degree	1	0
Father's age		
median	34	33
mean	33.5	30.38
Father's highest education level		
high school diploma	7	4
undergraduate degree	4	5
graduate degree	5	4
Families owning video games	8	7
Families allowing use of video games by children	8	7
Families owning computers	3	2
Families allowing use of computers by children	3	1

TABLE II
Interaction Summary Sheet

	Group I	Group II	Male	Female	Total
Number of children	17 53%	15 47%	15 47%	17 53%	32 100%
Number of interactions	68 60%	46 40%	52 46%	62 54%	114 100%
Number of interactions per child					Combined
mean	4.00	3.07	3.47	3.65	3.56
mode	4	2	3	3	3
Length of child/computer interactions in seconds					
mean	325.26	525.46	429.35	389.65	406.01

TABLE III

GROUP I



GROUP II

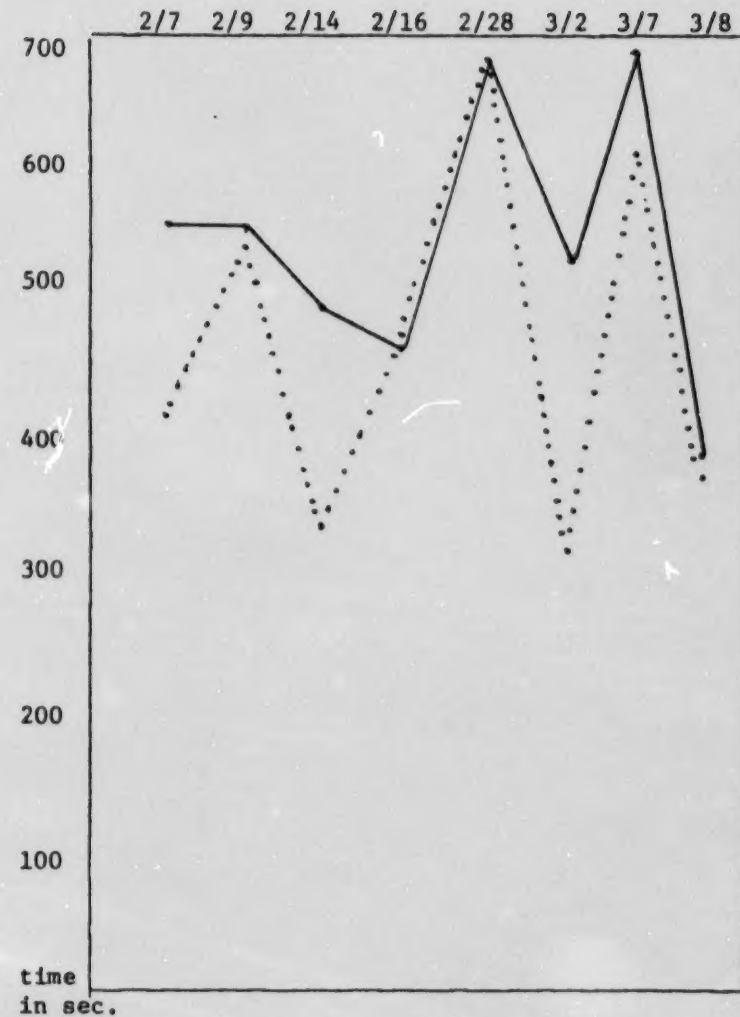
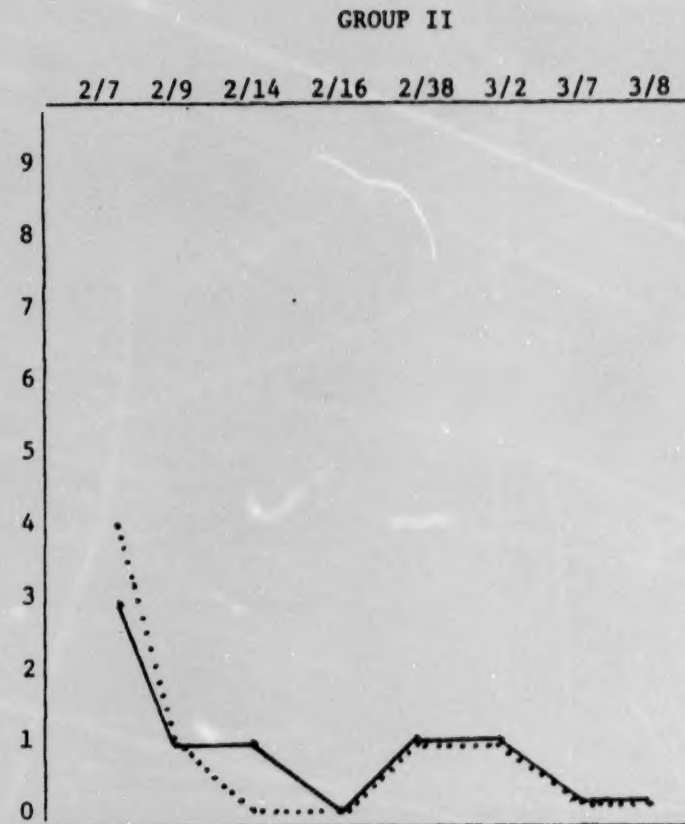
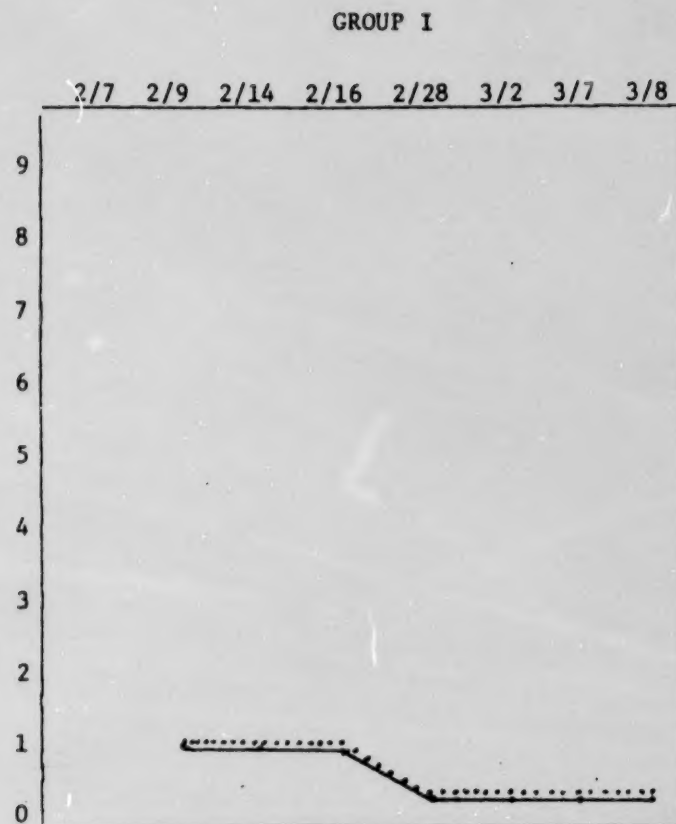


TABLE IV



Number of Observers at Center (5 minute intervals)

Median _____

Mode

CHAPTER V

CONCLUSIONS

The presence of a computer in the preschool setting was determined to be appropriate in a limited way by this study.

Replication of this study with a larger and more diverse population would increase the situations to which its results could be applied. Special attention should be given to including a low SES group in a new study.

A comparison between activities in some specific learning center already established in the preschool curriculum and the computer center would be useful. Such a study would compare type of activity, length of use, types of language and interaction in each center.

Longitudinal studies involving the comparison of school achievement among children who were introduced to computers early and those who were not introduced to them until later would yield special insights for the preschool educator.

Insights about the methods of introduction of computers must also be gained through careful observation. A study involving the comparisons of introduction through free play introduction through structured programming classes and introduction of computers

through computer-assisted-instruction should address attitudes as well as achievement.

One last area for investigation is the effect of video games on young children. The fact that all of the children in this study had access to video games is an indicator that educators must address the issue of their appropriateness.

The computer is not just the future. The computer is NOW. Educators must address its use in a responsible and reasoned way in order to make good decisions for their classrooms and their children.

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DRAWPIC

By Dennis Zander

Drawpic allows the user to create detailed and colorful graphic images which can be easily incorporated into your own programs. After you create an image using the various options of Drawpic, a machine language routine will save the bytes which represent the image and store them as part of the program in an ASCII string subroutine (image string). This subroutine instantly will put the image onto the screen at a point selected with the joystick controlled cursor. Smaller images can be added together to make larger ones, and size can be changed using a different compatible graphics mode.

Artworx Software Company, Inc.
150 North Main Street
Fairport, New York 14450

This information is from the documentation provided by Artworx.

VIDEO EASEL

By Atari

Video Easel is a unique combination of art and mathematics. It is also a terrific opportunity to learn about the fascinating game of "Life." You will explore the nature of symmetry, while creating artistic designs which change or evolve according to certain rules or laws ... Video Easel is designed for use by children and adults alike. Depending on age, interest, and experience each user will be able to learn something new and different.

Atari Software
Box 427
Sunnyvale, California 94086

This information is from the documentation provided by Atari.

BLOX

By Geof Nieboer

This is an adaptation of Drawpic which allowed children to manipulate premade shapes and position them to form new pictures. These shapes were basic geometric forms such as circle, square, rectangles and triangle.

Geof Nieboer
29635 Craw
Selfridge, Michigan 48045

Date: _____

Session: _____

Name	On	Off	Random	Purposeful	Skilled	Save Work	Comments	#	of Observers
								5	
								10	
								15	
								20	
								25	
								30	
								35	
								40	
								45	
								50	
								55	
								60	

February 6, 1983

Dear Parent:

Your child's nursery school is participating in an educational research project designed to judge the appropriateness of the computer in the preschool setting. The project is noncompulsory and will not interfere with other aspects of the preschool program.

In order to best apply the findings of this research it is necessary to gather some information about each student. Please complete the attached questionnaire and return it to the preschool as soon as possible. All information will be kept confidential.

Thank you for your cooperation.

Sincerely,

Ruth Ann Nieboer
Graduate Student
Oakland University

Child's first name: _____ Last initial: _____

Child's birthdate: _____

Number of children in the family: _____

This child's position in the family (first child, second child, etc.)

Child lives with: (circle one) Mother Father Both Other

Child spends most waking hours with: (circle one) Mother Father Both Other

Mother Age: _____

Occupation: _____

Education completed: (circle one) high school
undergraduate degree
graduate degree

Father Age: _____

Occupation: _____

Education completed: (circle one) high school
undergraduate degree
graduate degree

Do you own a video game machine? _____

Is the child allowed to use it? _____

Do you own a computer? _____

Is the child allowed to use it? _____

This project reserves the right to publish or display all statistics while maintaining confidentiality and to publish or display photos and/or audio and video tapes of the project.

If you do not wish your child's photo used in this manner please note that on the back of the questionnaire. Thank you.

SELECTIONS FROM TRANSCRIBED RECORDINGS AT THE COMPUTER CENTER

Student: Oh, look at that. Ha, ha!
 Don't Jimmy. Can't you see I'm working?
 I'm making a mountain. I go up there.
 Then I go upside-down. I need to go up
 there. When I'm down here I need to go up
 there for mountains.

Student Observer: Where are you right now?

Student: (points to cursor)

Student Observer: How can you tell?

Student: It burps.

Student: I can read a book, really! I can do a 'puter, can't
 I? I can do anything. I can do anything Ooooooooooh.
 I'm doing it. I got it. I got it. I'm doing it,
 ain't I? I'm getting there. I'm really good at it.
 I'm finished now. Look at me! I'm getting it,
 really.

Student Observer: It looks like a castle.
 There's stairs and a flag on top.

Student: No ... it's a train. My video game ... my
 video game ... now it is going ... woo woo ...
 You don't know, don't know where I'm at.
 I'm over her. I'm in that train. I'm going.
 Woo woo. Look at what I'm making now. It
 looks like a building to me.
 What does it look like now? Nothing.
 Oops, the dragon ate it.
 Nope, it is still a train.
 I made a train.

Student Observer: What is it?

Student: I'll show you when I'm finished.

Student Observer: It was a stair but now it is a different
 thing. Trace it like that.

Student: I'll do it.

Student: I'm an airplane. (yeow)
It just went around the block.

Researcher: Yes, it scrolled.

Student: Yep, my airplane scrolled around.

Researcher: I'm doing quad drawing. I draw one line and
the computer draws four like it. Could you
do that with a pencil?

Student: I couldn't hold four pencils.

Researcher: You can only do this with a computer.
I'll erase mine and you can make one.

Student: (giggles) Alright! Hey, Miss Corder.
Hey, guys. Look I'm doing that!

Student: I made a seven...and a teensy one...another
seven. I'm good at this. (car sounds)
There's a four. (drawing has a serpentine
look)
Could you beat a dragon?

Student Observer: Oh, sure, I'd throw a knife. Agh.
I'm a mean monster.

Student: You couldn't beat real ones.

Student Observer: There ain't real ones.

Student: I saw a monster.

Student Observer: I saw a big monster.

Student: I saw a bigger one.

Student Observer: Mine was BIG.

Student: Mine was BIGGER one.

Student Observer: Now it is my turn.

Student: Okay.

Student: I'm ready to do this...I never done it before.

Researcher demonstrates.

Student: Hey this is pretty good. (giggles)
This is where I live. See, it is the "Nited
States." There is where my Nana lives and
Mickey Mouse.

Student: This is a part of a sink.
 Researcher: Which part?
 Student: You know, under, where the plumber comes.
 I think it needs one more...there.

Student: There you go. Isn't this fun? I need something
 over there. (Indicates blank area)
 Opps, it is broken (Indicates open curve)
 There I fixed it. It was broken, I fixed it.
 It had nothing to hold it up. Know what it
 is? I made it. It is mine!

Student Observer: Are you making a space ship?
 What is it?

Student: Just a funny thing.

Student Observer: Will I know it?

Student: Only if you are me.

Researcher: Would you tell me about your drawing?

Student: It is a city. There's the roads. People
 lives there. And a shopping center. It
 needs an airport. I can make it. (does so)
 I guess I'm done (gets up).

Researcher: Could I save this one?

Student: If you want but I could do it again.